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Satoshi SHINADA, et al.

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Examiner: Michael P. Nghiem

Filed: October 30, 2000

For: INK CARTRIDGE FOR USE IN AN INK JET RECORDING APPARATUS

SUBMISSION OF CERTIFIED ENGLISH TRANSLATION OF PRIORITY DOCUMENTS

Commissioner for Patents
Washington, D.C. 20231

Sir:

Submitted herewith are certified English translations of the priority documents submitted to the U.S. Patent and Trademark Office on March 7, 2001, on which a claim to priority was made under 35 U.S.C. § 119. The Examiner is respectfully requested to acknowledge receipt of said translated priority documents.

Respectfully submitted,

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Enclosures: **Publication 2001-121715 (translation)** corresponding to JP H11-308762
Publication 2001-138535 (translation) corresponding to JP H11-323713
Publication 2001-310480 (translation) corresponding to JP 2000-129704
Publication 2001-277534 (translation) corresponding to JP 2000-101676

Date: October 28, 2002

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
VERIFICATION OF TRANSLATION

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

I, Atsunori Murata, of 1-14 Higashi-hiratsuka-cho, Naka-ku, Hiroshima 730-0025
declare:

- (1) that I know well both the Japanese and English languages;
- (2) that I translated the Japanese document entitled "Ink cartridge for use with an ink jet recording apparatus" from Japanese to English;
- (3) that the attached English translation is a true and correct translation of the above-identified Japanese document to the best of my knowledge and belief; and
- (4) that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 USC 1001, and that such false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated: October 21, 2002

Atsunori Murata
Atsunori Murata

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J0078512 (2001-138535)

[Name of Document] Specification

[Title of the Invention] Ink cartridge for use with an inkjet recording apparatus

What is claimed is:

[Claim 1] An ink cartridge for use in an ink jet recording apparatus, comprising:
an ink cartridge composed of a container, stored in the holder of a carriage, having a storage chamber prepared, communicating via an ink supply port with an ink supply needle of an recording head installed on the carriage,
an internal area of said container, partitioned into multiple areas by walls, at least one of the areas stores ink, and is provided with said ink supply port.

[Claim 2] The ink cartridge for use in an ink jet recording apparatus according to claim 1, wherein partitioning is by a first wall perpendicular to the arrangement direction of said carriage's ink supply needles so as to form a space opposed to each ink supply needle, said space is divided by second walls orthogonal to the first wall.

[Claim 3] The ink cartridge for use in an ink jet recording apparatus according to claim 1, wherein divisions are made by walls parallel to the arrangement direction of said carriage's ink supply needles, where the area in which said ink supply port is divided so as to communicate with said ink supply port.

[Claim 4] The ink cartridge for use in an ink jet recording apparatus, wherein an ink cartridge is composed of a container, stored in a carriage holder, prepared with an ink chamber where ink is absorbed and stored by a porous member, communicating via the ink supply needle and ink supply port with a recording head installed on the said carriage, as well as a lid member sealing an opening portion of said container, and ribs are formed in an area in the back of said lid member so as to be opposed, at least, to said ink supply ports, of a height corresponding to the height of said porous member so as to be capable of pressing said porous member toward said ink supply port, the ink volume is adjusted according to the volume of said porous member.

[Claim 5] The ink cartridge for use in an ink jet recording apparatus, wherein an ink cartridge is composed of a container stored in a carriage holder, prepared with an ink chamber where ink is absorbed and stored by a porous member, communicating via the ink supply needle and ink supply port with a recording head installed on the said carriage, a wall partitioning said ink chamber is positioned inside of a side portion in contact with said holder.

[Claim 6] The ink cartridge for use in an ink jet recording apparatus, according to claim 1, wherein the area partitioned in the said container, and the area not provided with said ink supply port are open to the outside of said container, and the ink cartridge is stored in an impermeable airtight package and maintained at a pressure lower than air pressure.

[Claim 7] An ink cartridge for use in an ink jet recording apparatus, according to claim 1, wherein a memory element is affixed, with information related to the volume of ink stored in said container, capable of being read by the recording apparatus.

[Detail Description of the Invention]

[0001]

[Field of the Art]

The invention relates to an ink cartridge for supplying ink to a recording head. The ink cartridge is mounted on a carriage in which a recording head for jetting ink droplets is attached.

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[0002]

[Related Art]

An ink jet recording apparatus prints images of photo-like quality with a relatively simple structure, so that it is widely used as a recording apparatus for personal use. In such a recording apparatus, recording heads for a black ink and color inks are generally mounted on a carriage, then cartridges for the black ink and the color inks are installed thereon, thereby the inks are supplied to each recording head via an ink supply needle.

[0003]

[Problem to be solved by the invention]

In the case that most of the printing to be printed by the recording apparatus is composed of text data, the amount of the color inks to be used is little and the color inks are not frequently used, so that the frequency of an exchange of the color ink cartridge is much lower than that of the black ink cartridge. Accordingly, there is a problem that the effective data of the color ink cartridge expires before the consumption of all of the color inks, which requires the premature replacement of the color ink cartridge, thereby increasing the cost. On the other hand, when a color printing is often conducted, the black ink is not frequently used, and the effective date may expire before consuming all of the ink in the black cartridge. Moreover, when the recording apparatus itself is not used frequently, the effective date expires when the inks remain in both black and color ink cartridges. In order to solve the above-mentioned problem, an ink cartridge may be produced by decreasing the volume of the ink cartridge. However, a gap is generated between the ink cartridge and a holder housing the ink cartridge, so that a distortion may be generated by the reciprocating carriage at a connecting portion between the ink supply needle and an ink supply port. Also, a new metallic mold is necessary, thereby increasing costs. In order to solve those problems, as shown in Japanese published application no. 9-262988, a filter is inserted in the bottom of a container body composing an ink cartridge with a normal volume so as to decrease the amount of filled ink. According to the reference, just inserting the filter in the container body makes the amount of the filled ink decrease without changing a shape of the container. However, a shape adjacent to an ink supply port is changed, which greatly affects the outflow characteristics of ink to the recording head. Therefore, the printing characteristics may be fluctuated. In view of these problems, it is an object of the present invention to provide an ink cartridge with a small volume, which has the same characteristics of ink discharge as those of an ink cartridge with a normal volume.

[0004]

[Means for solving the problem]

In order to solve these problems, in the present invention, an ink cartridge is composed of a container stored on a carriage holder, with an ink storage area that communicates via an ink supply port and an ink supply needle with the recording head installed on the carriage. An inner space of said container is partitioned into multiple areas by walls. At least one of the areas stores ink, and is provided with said ink supply port.

[0005]

[Effect]

While maintaining the same coordinates of the positioning area of an ink cartridge in which normal volume of ink is stored, only the ink storage volume is decreased without producing changes to the structure or adjacent to the ink supply port.

[0006]

[Embodiment of the invention]

What follows is an explanation based on the embodiment illustrating the details of the invention. Figs. 1 and 2 show one embodiment of the present invention of an ink cartridge for use in an ink jet recording apparatus, exemplifying a color ink cartridge. A container 1, prepared with an outer contour that can be installed on a cartridge holder in a predetermined condition, is divided in accordance with the number of ink colors, into three rectangular parallelepiped chambers in this

embodiment, by the first walls 2, 2 which are perpendicular to the arrangement direction of an ink supply needle. Each chamber is further divided into two areas 3a and 3b by the second walls 4, 4 and 4.

[0007]

One of the areas 3a divided by the wall 4 is formed as an ink chamber, and is provided with an ink supply port 5 on the bottom portion as in a normal ink cartridge. At least, the ink storage area 3a of the opening portion of a container 1 is sealed with a lid member 6. On the lid member 6, an ink injecting port 7 and an air communicating port 8, positioned at the ink storage area 3a, are formed. The air communicating port 8 is formed on the surface of the lid member 6, and is connected to an air opening port 10 via narrow grooves 9 that forms capillaries by sealing with a gas impermeable film (not shown in the drawing).

[0008]

Also, when the edge of the narrow grooves 9 shown in Fig. 1 (b) is formed as an air opening port 10', composed of penetrating holes communicating with one of the cavities 3b, negative pressure stored in the cavities 3b keeps the ink storage areas 3a under negative pressure conditions until the gas impermeable film is removed when using the ink cartridge. Also, when removing the gas impermeable film, a large opening area is obtained as quickly as possible, therefore ensuring that the areas storing ink are opened to the air via the narrow grooves 9. Even if, for example, ink flows to the air communicating hole 10' through the narrow grooves 9 during the transportation process, the ink is collected to the cavities 3b so as to prevent ink leakage outside.

[0009]

Further, as shown in Fig. 2 (b), when an air communicating port 8' which is the same as the air communicating port 8, is also provided to a cavity 3b and the ink cartridge is distributed under reduced pressure in a gas impermeable and airtight package, the volume of the cavity 3b can be used as a space under reduced pressure. Therefore, it is possible to maintain reduced pressure conditions in the airtight package even if the ink cartridge is not used soon after manufacturing, and to provide degassed ink to consumers. It is extremely effective for maintenance of the apparatus when a recording apparatus is used after a long period of disuse, i.e. the removal of bubbles that have entered the recording head by using a degassed ink.

[0010]

Also, when the cavity 3b is sealed with the lid member 6, when the air in the cavity swells, an adjacent barrier wall changes the volume of the adjacent ink storage area. However, it is possible to prevent this negative effect by providing the air communicating port 8'.

[0011]

According to this embodiment, as shown in Fig. 3, when an ink cartridge is installed in a cartridge holder 11 and an ink supply needle 12 is inserted into the ink supply port 5, communication with a recording head 13 is maintained in a condition in which the peripheral area is maintained by the internal wall of the holder 11. Therefore, supply of ink to the recording head 13 is ensured despite the reciprocation of the cartridge.

[0012]

In the above-mentioned embodiment, one of the areas divided by the wall 4 is a cavity portion. However, as shown in Fig. 4, an ink supply port 5', is also formed in a cavity 3b. In addition, an air communicating port 8', an ink injecting port 7', and a groove independent from the air communicating port 8 are formed in the lid member 6. By forming these to an ink storage area, even if ink in the area 3a is consumed or the use period expires, when an ink supply needle 12' is inserted into another ink supply port 5', the ink cartridge use period can be extended.

[0013]

Also, by filling the area 3b with maintenance liquid, when color printing will obviously not be implemented for an extended period, the recording head is filled with a maintenance liquid, preventing difficulties such as clogging with ink solidification.

[0014]

In the above-mentioned embodiment, the whole container body is divided according to the number of ink supply ports, and the divided container body is further divided into ink storage areas and cavities by the walls. However, as shown in Fig. 5, the container body may be divided into ink storage areas 15 and a cavity 16 by a common wall 14 so that the ink storage areas 15 are only divided according to the number of types of ink by walls 17.

[0015]

Also, in the above-mentioned embodiment, the lid member 6 seals the whole container body. However as shown in Fig. 6 (a), it is possible to seal only the ink storage areas 15 with a lid member 6' so as to leave open a cavity area 16, and as shown in Fig. 6 (b), a cylinder may be formed by forming an opening 18 on the bottom of the cavity area 16.

[0016]

Figs. 7 and 9 (a) both show one embodiment of a cartridge, a type in which a porous member absorbs ink and is stored in a container. An ink cartridge 20 is comprised of a container body 22 made from high polymer material forming an ink chamber 21 for obtaining a substantially rectangular parallelepiped space therein, and a lid member 23 sealing an opening of the container body 22. In the container 22, a porous member 24 that absorbs and holds the ink, substantially in the shape of a rectangular parallelepiped is, inserted.

[0017]

The porous member 24 is pressed in the vicinity of an ink supply port 26 by a rib 25 formed at the area facing the ink supply port 26, at the back of a lid member 23. Therefore, capillary action in the vicinity of the ink supply port 26 is high, peripheral ink is attracted to the ink supply port 26, ensuring that the porous member 24 supplies ink to a recording head.

[0018]

When the ink volume is minimized in such an ink cartridge, while the cross sectional shape is substantially the same as shown in Figs. 8 and 9(b), a porous member 24' whose height H' is lower than height H of the porous 24 is inserted into the container body 22, and is sealed with a lid member 23' having a rib 25' with predetermined height for pressing the low-height porous member 24' toward the ink supply port 26.

[0019]

In such an embodiment, the shape formed in the vicinity of the ink supply port is substantially the same as that of the ink cartridge with a normal volume, so that the ink supply performance is not changed. Moreover, since the expensive metallic mold for producing the container body can be standardized, costs can be kept low.

[0020]

Also, when the recording apparatus body controls the volume of ink supplied from the ink cartridge to the recording head, recognition is necessary that the ink cartridge has been manufactured as a small volume type. As shown in Figs. 7 through 10, a memory element 26 capable of being read from the recording apparatus is affixed to the cartridge. As information is written to this memory element regarding the ink volume, the recording apparatus can easily recognize the ink cartridge specifications. As information related to the ink volume, not only the volume of ink that can be supplied to the recording head from the cartridge but also the volume with which the cartridge is filled may be stored.

[0021]

Also, when using a writable memory element 26, by writing the amount of ink used by the recording apparatus to the memory element, the ink cartridge is retrieved from the recording apparatus with the remaining ink. Therefore even if reinstalled, the recording apparatus can accurately recognize the volume of usable ink.

[0022]

In addition, as shown in Fig. 10, while an area 22a'', which participates in positioning the cartridge and cartridge holder, is maintained as in a container body 22 with a normal volume (Fig. 8), the width W of an ink chamber 21'' is narrowed, meaning that a side wall 22b'' is positioned inward from the outer shape. In addition, a porous member 24'' with a corresponding width W' is stored and sealed, thereby producing the same effect.

[0023]

[Effect of the invention]

As explained above, in the present invention, an ink cartridge is presented which is composed of a container stored on a carriage holder, prepared with an ink storage area, communicating via an ink supply needle with a recording head installed on a carriage. In this ink cartridge, an inner space is partitioned into multiple areas by walls. At least one of the areas stores ink, and is provided with said ink supply port. Therefore, it is possible to reduce the volume of the ink storage area while maintaining the same form of a container with a normal volume. The carriage movement does not have an adverse effect, and the ink cartridge has a volume of ink appropriate to small printing quantities.

[Brief explanation of the drawings]

Figs. 1 (a) and (b) both show examples of the present invention as a cartridge for color ink, with the lid member removed.

Figs. 2 (a) and (b) both show cross sectional structure views of one of the ink storage areas of the ink cartridge in Fig.1.

Fig. 3 shows the ink cartridge in Fig.1. installed to a carriage.

Fig. 4 shows a cross-sectional structure of another embodiment of the present invention.

Fig. 5 shows an example of another embodiment of the present invention, an ink cartridge for color ink, with the lid member removed.

Figs. 6 (a) and (b) both show cross sectional views of another embodiment of the present invention.

Fig. 7 is a perspective assembly view showing one embodiment of the ink cartridge, a type in which a porous member absorbs ink.

Fig. 8 is a perspective assembly view showing one embodiment of an ink cartridge with a small volume, in which a porous member absorbs ink.

Figs. 9 (a) and (b) are cross sectional structure views of an ink cartridge with a normal volume and a small volume respectively, in which a porous member absorbs ink.

Fig. 10 is a perspective assembly view showing another embodiment of an ink cartridge with a small volume, in which a porous member absorbs ink.

[Explanation of symbols]

1. Container
2. First wall
- 3a. Ink storage area
- 3b. Cavity
- 5, 5'. Ink supply port
6. Lid member
- 7, 7', Ink injecting port
- 8, 8'. Air communicating port
9. Narrow groove
11. Cartridge holder
- 12, 12'. Ink supply needle
13. Recording head

[Abstract]

[Object] The present invention provides a small volume ink cartridge having a same ink discharge characteristics as those of a normal volume ink cartridge.

[Means for solving problem]

An ink storage area 3a is provided that communicates via an ink supply port 5 and an ink supply needle 12 with an recording head 13 installed on a carriage. The inner space of container 1, which is stored on carriage holder 11, is partitioned into multiple areas 3a and 3b by walls 2. Ink is stored in the area 3a, and communicates via the ink supply port 5.